## Large-Scale Topography on Main-Belt Asteroids: Evidence from Arecibo Radar Spectra

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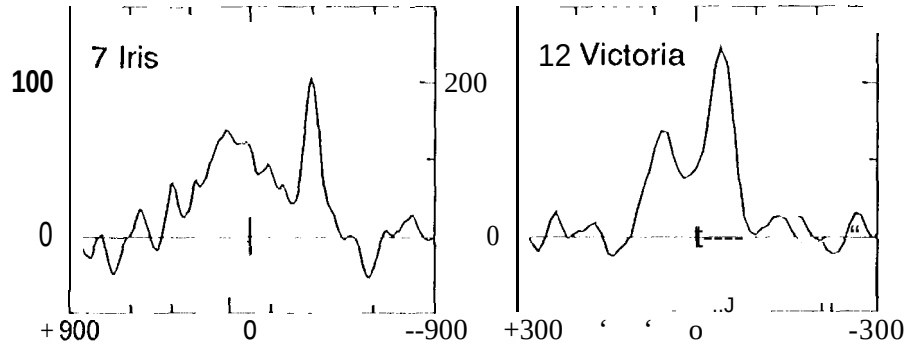
Arecibo 2.13-cm radar spectra of the main-belt asteroids 7 Iris, 9 Metis, 12 Victoria, 216 Kleopatra, and 654 Zelinda exhibit evidence for large-scale topography. These asteroids range in diameter from 113 to 200 km and include members of the S, C, and M classes. Radar "glints" appear in narrow ranges of asteroid rotation phase in spectra of Iris, Metis, and Zelinda. These glints. which can briefly account for a significant fraction of the total echo power, arc likely caused by single back-reflections from large, flat regions. For Iris (left figure), the glint is resolved in Doppler frequency, allowing us to constrain onc dimension of the flat region to be >20 km in extent, or roughly 10% of the asteroid's diameter.




Radar spectra of Victoria and Kleopatra are bimodal over >30° ranges of asteroid rotation phase, indicating non-convex, possibly bifurcated shapes. Echoes from Victoria are strongly bimodal near one rotation phase (right figure) but *not* near rotation phases ~180° away, suggesting an irregular, non-convex shape. The upgraded Arecibo is expected to provide a >10-fold increase in radar sensitivit y that will permit delay-Doppler imaging of Iris in late 1995, Metis in 1997, Kleopatra in 1999, Zelinda in 2002, and Victoria in 2007.

The figures plot $km^2$ of radar cross section per frequency resolution element (90 Hz for Iris and 30 Hz for Victoria) vs. Doppler frequency (Hz). The vertical bar at the origin shows ±1 standard deviation of the noise. The spectra may be thought of as one-dimensional images in which each frequency "pixel" measures the echo power in a strip parallel to the asteroid's apparent projected rotation axis.